

A Legacy of Sustainability

FISCAL YEAR 2015 ANNUAL SUSTAINABILITY, ENERGY
AND WATER CONSERVATION REPORT



Photo Features

Cover: Pope Francis makes remarks from the balcony of the Speaker of the House on the U.S. Capitol's West Front, September 24, 2015.

At right: The Statue of Freedom sits atop the Dome of the U.S. Capitol.

Pages 2-3: The Architect of the Capitol's (AOC) solar photovoltaic system on the roof of the Hart Senate Office Building, installed in Fiscal Year (FY) 2015.

Pages 10-11: An aerial view of the U.S. Capitol and House office buildings.

Pages 20-21: The Progress of Civilization Pediment located on the East Front of the U.S. Capitol.

Pages 42-43: Master of ceremonies and Architect of the Capitol Stephen T. Ayers at the podium for the 2015 Capitol Christmas Tree lighting ceremony.

Pages 44-45: A large chiller system arrives for installation at the Capitol Power Plant. The equipment is used to cool AOC spaces.

Back Cover: The East Front of the U.S. Capitol. The scaffolding is part of the AOC Dome Restoration project to repair cracks and deficiencies.

All photographs provided by the AOC's Photography Branch.

Congressional Mandates and Oversight

The AOC is part of the legislative branch of government and serves Congress and the U.S. Supreme Court. As stewards of the Capitol campus and its off-site facilities, the AOC is required to meet annual reductions in energy consumption under the Energy Policy Act of 2005 (EPA2005) and the Energy Independence and Security Act of 2007 (EISA2007).

In accordance with EISA2007, the AOC is driven to apply aggressive standards to reduce energy use by 3 percent annually from FY 2003 levels, yielding a 30 percent total reduction by FY 2015.

This report was created to inform Congress and the public of the AOC's progress on meeting its efficiency goals as well as its future commitments to sustainability and water efficiency. It includes details on the AOC's approach, achievements and areas identified for continued progress.



Our Mission

To serve Congress and the Supreme Court, preserve America's Capitol and inspire memorable experiences





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Message from the Architect of the Capitol

Fiscal Year (FY) 2015 has been a significant and rewarding year for the Architect of the Capitol's (AOC) sustainability efforts. Thanks to the dedicated work of teams across the agency, we successfully met the 2007 Energy Independence and Security Act mandate to reduce energy consumption by 30 percent from our FY 2003 baseline. Ten years ago, we began working to meet this aggressive goal and have accomplished it by implementing a comprehensive energy management program.

This annual report presents the agency's notable achievements in energy and sustainability for FY 2015. We have continued to focus on energy efficiency, sustainable practices and cost reduction. As a result, we identified more than \$80 million in cost avoidance, executed \$90 million in facility upgrades, saved 600 Billion British Thermal Units (BBTUs) and reduced our emissions by 25 percent between 2006 and 2015.

Our decade-long effort led to best practices that will set us on the road to meet new energy and sustainability commitments and preserve the character of our nation's buildings. The years were marked by an ever-evolving set of challenges and opportunities; however, it is with great enthusiasm that I say we are not done yet.

The AOC's investments in energy conservation are not for the short-term. These investments in the future of our nation's treasures drive productivity, improve efficiency and support the environment for our neighbors and community. We are setting new goals for energy, greenhouse gases, water, renewables, clean energy and ongoing high-performance buildings.

As part of our long-term Strategic Vision, the AOC is committed to strengthening a culture of sustainability aligned with fiscal responsibility. In the years ahead, we will continue our contributions toward meeting new goals and major projects such as cogeneration; and preparations will be made for future investments in energy savings in the Library Buildings and Grounds jurisdiction.

Finally, I would like to thank congressional members and the public for their support of the AOC's unique mission to continue its legacy of sustainability. Thank you for helping the agency be successful in meeting its goals.

Sincerely,

A handwritten signature in black ink, reading "Stephen Ayers" with a stylized flourish at the end.

Stephen T. Ayers, FAIA, LEED AP
Architect of the Capitol

WHAT WE ACCOMPLISHED FY 2015

The Capitol Power Plant provides steam and chilled water to heat and cool more than 20 buildings across Capitol Hill as well as the Government Publishing Office and Union Station.

30.9%

Energy reduction from our
FY 2003 baseline

16.5%

Water reduction
from our FY 2007 baseline

\$17 Million

Costs avoided through
new energy reductions

25%

Reduction in the AOC's
greenhouse gas footprint

15,158 Vehicles

Reductions in the AOC's greenhouse
gas footprint equate to 15,158
passenger vehicles off the road

46%

Operational materials
recycled

15,000 Homes

FY 2015 energy savings equals the
power consumed in 15,000 homes

4,000 Tons

Operational waste recycled

22.7%

Total electricity produced with
renewable energy credits

90%

Construction
waste debris recycled

5,200 Tons

Construction waste recycled

ENERGY AND SUSTAINABILITY TIMELINE

1975

The AOC establishes its first energy conservation program.



1980s

The AOC completes its first lighting retrofit.



2000

The AOC completes a campus-wide lighting system upgrade.

2015

The AOC meets the EISA2007 mandate to reduce energy consumption by 30 percent from its FY 2003 baseline. To meet its goal, the agency installed \$90 million in facility upgrades and identified more than \$80 million in cost avoidance.



1990s

The AOC completes its first campus-wide building automation network.



2007

EISA2007 authorizes an energy reduction increase to 3 percent per year for a total reduction of 30 percent by FY 2015.



2005

EPAct2005 authorizes the AOC to reduce energy, use alternative fuel vehicles and report on its energy program.

2012

The AOC completes construction for three energy service performance contracts.



2010

The AOC establishes the Energy and Sustainability Branch.

2009

Green the Capitol Initiative launches and the AOC completes its Sustainability Framework Plan.

2008

The AOC installs an E-85 fueling station for fleet vehicles.





Message from the Director of Design Services, Energy and Sustainability

On behalf of the Design Services, Energy and Sustainability Division, I would like to thank our staff and congressional clients for their support in meeting the Architect of the Capitol's (AOC) energy and sustainability initiatives this year. Fiscal Year (FY) 2015 marked tremendous progress for the AOC's energy management program and demonstrated its leadership through key initiatives. To accomplish its goals, the AOC used data and numerous tools to measure, manage and improve building performance. The AOC recognized that to make decisions based on sound analysis it must be adequately informed about the nature and extent of its profile, how that compares to other similar buildings and what the agency can do to address known performance gaps.

Beginning in 2005, the AOC implemented a comprehensive metering program for all buildings on the Capitol campus, embracing the principles of MEASURE, MANAGE, IMPROVE. By measuring utilities, we were able to identify and manage energy intensive use areas. We used this information to identify energy reduction opportunities and ultimately incorporated our utility infrastructure into a Utility Metering Enterprise System. Today, this web-based system allows AOC personnel to quickly sort, filter and analyze large amounts of real-time data and generate reports for various requirements. Together, the use of building data and models, provides early insights on operational performance and propels new prospects for energy conservation.

The AOC's Strategic Vision addresses principal program areas and includes a commitment to engagement, outreach and education on sustainability, energy conservation and efficiency. In FY 2015, the AOC implemented energy challenges, continued expansion of its biking program, conducted collaborative sessions and educational webinars to drive new and innovative energy and sustainability ideas from within the agency.

Through these projects, the AOC made significant upgrades that represent a substantial portion of the AOC's overall success. As we continue to protect our neighboring and national environment, the AOC opens a new chapter in its legacy. Following our FY 2015 achievements, the AOC will commit to new sustainability goals and continued reductions in energy consumption by 2 percent annually, or an aggregate of 20 percent by the end of FY 2025, or a 50 percent energy reduction in comparison to the AOC's FY 2003 baseline.

This report represents the agency's continued commitment to preservation, resource conservation and improving the well-being of our environment, staff and its programs.

Sincerely,



Charles "Chuck" Iliff, PE, LEED AP, CEM, CFM
Director of Design Services, Energy and Sustainability

Section One





Executive Summary

The Capitol campus is an intricate network of buildings, infrastructure and thousands of people who work or visit each day. The AOC uses these three overarching elements — BUILDINGS, INFRASTRUCTURE and PEOPLE — as a method for developing and communicating commitments for energy, water, materials, indoor environmental quality and site components.

Buildings

- AOC buildings include a footprint of more than 17 million square feet of space. The building element includes exterior envelope, mechanical and electrical systems, digital data, interior finishes and historically significant architectural elements, art and library collections.

Infrastructure

- The AOC's infrastructure consists of the Capitol Power Plant, utility distribution system and more than 580 acres of grounds. The Capitol Power Plant provides steam and chilled water for heating and cooling to more than 20 buildings across Capitol Hill as well as the Government Publishing Office and Union Station.
- Infrastructure also includes other components essential for the safe and secure operation of the buildings, telecommunication controls, security systems and transportation within the Capitol campus.

People

- The AOC employs more than 2,100 full-time employees, serves 30,000 tenants and welcomes more than 3 million visitors a year.
- Across Capitol Hill, architects, engineers and technicians design, enhance and maintain new and historic structures, spaces and building systems. Employees in various trades such as electricians, mechanics, landscapers, masons and carpenters maintain the buildings and infrastructure.
- The facilities maintained by the AOC are occupied by U.S. Senators, Representatives, Supreme Court Justices and thousands of other government employees.
- The AOC works to positively influence the behavior of the tenants and visitors with educational campaigns and design elements to promote environmental responsibility.

FIGURE 1: SUSTAINABILITY PROGRAM ELEMENTS

PRIORITY COMPONENTS



Figure 1 shows the relationship between the AOC's overarching elements (buildings, infrastructure and people) and components of its sustainability program (materials, energy, water, site and indoor environmental quality).

Pursuing a Strategic Vision for Sustainability and Energy

The AOC's Strategic Vision provides a framework for performance reporting for FY 2012-2016. The vision addresses principal program areas related to facility operational support, project delivery and preservation.

The strategic objectives under goals "One Team, One Mission" and "Innovative and Empowered Workforce" focus on promoting a culture of integrity, teamwork and accountability. Goals "Awe-Inspiring Facilities" and "Extraordinary Services" address principal program areas related to facilities operational support, project delivery, preservation of heritage assets and historic structures and visitor services. Each goal and objective contains performance measures that show how the AOC is making progress.

For energy and sustainability, the Strategic Vision builds on three focus areas:

- Improve facilities' asset performance through energy and resource conservation.
- Integrate sustainable practices into business operations.
- Strengthen a culture of sustainability with stakeholders and external organizations.

Strategic Area One: Improve Facilities' Asset Performance through Energy and Resource Conservation

Energy reduction targets found in the Energy Independence and Security Act (EISA2007) are the primary metrics used to assess the AOC's energy performance. The AOC successfully met the final EISA2007 energy reduction goal in FY 2015. EISA2007 required the AOC to reduce its energy consumption by 3 percent annually for FY 2006-2015, or an aggregate of 30 percent, from an FY 2003 baseline. The AOC exceeded this requirement with a 30.9 percent reduction (see figure 2).

Strategic Area Two: Integrate Sustainable Practices into Business Operations

The AOC continues to find new ways to integrate sustainability into its services. In FY 2015, the agency enhanced its existing building automation system by implementing software that readily identifies performance deviations and quantifies the energy and cost impact of these deviations. This enhancement allowed the energy management teams to find and prioritize these opportunities and address them in a timely fashion.

In FY 2015, the agency continued its focus on energy assessments, retro-commissioning, technical design guidance and training to ensure persistence of energy savings. The AOC also partnered with the Association of Energy Engineers for ongoing education and certification programs.

Specific examples of business operations tools developed:

- Sustainability guidelines for design, construction and purchasing.
- Management plans to incorporate sustainability into daily operations.
- Execution of a construction waste management specification.
- Execution of demand response plans on peak electricity grid consumption days.
- Project scorecards to ensure energy conservation and sustainable best practices are evaluated throughout the planning, design and construction process.

Strategic Area Three: Strengthen a Culture of Sustainability with Stakeholders and External Organizations

The AOC facilitates and supports working groups that consist of stakeholders from across Capitol Hill, other government agencies and external trade associations. Internally, the AOC engages with staff from the House Office Buildings, Senate Office Buildings, Library Buildings and Grounds, U.S. Botanic Garden, Capitol Grounds, Capitol Power Plant, Office of Security Programs and the Supreme Court Building and Grounds on its sustainability and stewardship goals. These efforts strengthen a culture of sustainability by involving the Capitol Hill community in understanding and setting a vision toward environmental stewardship.

FIGURE 2: ANNUAL ENERGY REDUCTIONS

ENERGY REDUCTION THROUGH FY 2015

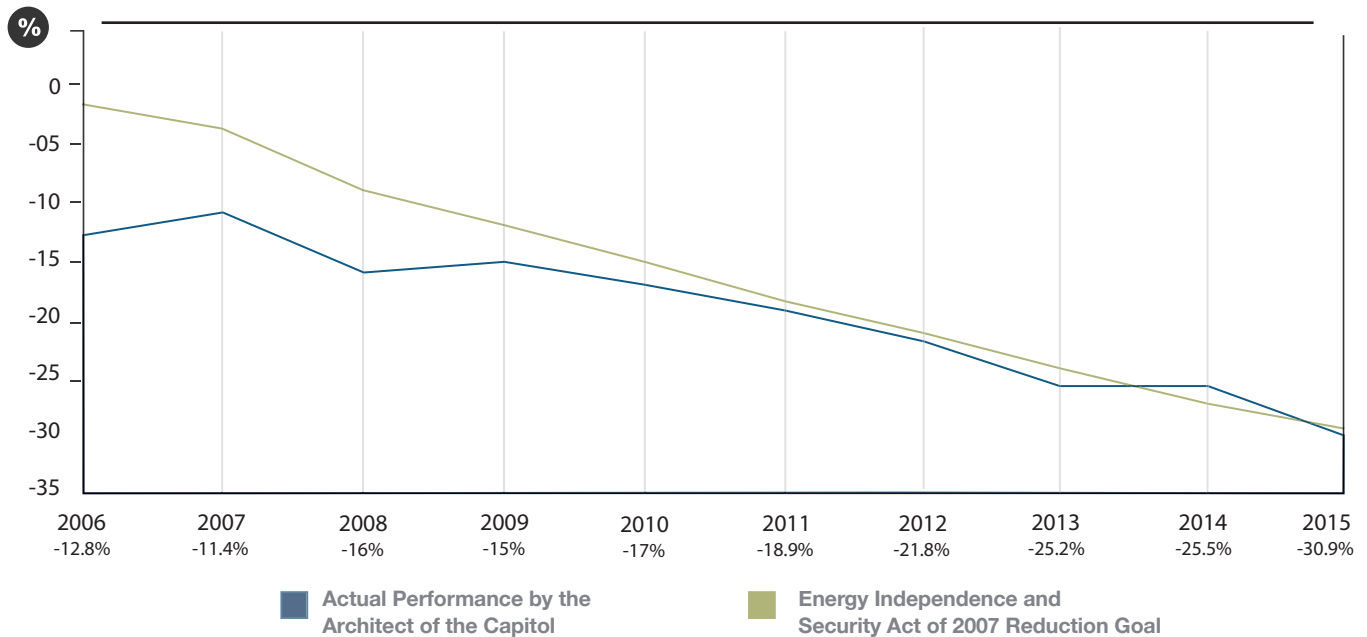


Figure 2 illustrates the AOC's energy performance toward the EISA2007 reduction goal from FY 2005 to FY 2015. The law requires a reduction of 3 percent in energy consumption every year from the FY 2003 baseline with a total of 30 percent by FY 2015. The AOC successfully met the final energy reduction goal in FY 2015.

Capitol Hill initiatives championed by the AOC:

- Bicycle Advisory Committee
- Energy Management Working Group
- Preservation/Heritage Assets Working Group
- Sustainability Working Group

The AOC also works with external groups and participates alongside executive branch agencies, representing the legislative branch at federal stakeholder meetings. The intent is for the AOC to learn from best practices and communicate its program, goals and initiatives outside of the agency.

External participation includes:

- Association of Energy Engineers
- Building Commission Association

- 
- Building Technology Research and Development Working Group
 - Construction Industry Institute
 - Construction Management Association of America
 - Federal Energy Savings Performance Contracting Steering Group
 - Interagency Sustainability Working Group and Energy Conservation Working Group
 - Interagency Energy Management Task Force
 - International District Energy Association
 - International Facility Management Association
 - Monumental Core Climate Adaptation Working Group

FY 2012-2016 Energy and Sustainability Commitments

The AOC's energy and sustainability success is measured by how well it reduces the cost and environmental impacts of its buildings and services. With this in mind, in FY 2011, the AOC announced 17 energy and sustainability commitments for FY 2012-2016 that address buildings, infrastructure and people and align with the objectives of the AOC's Strategic Vision. The commitments are summarized on pages 18-19 and grouped into the following categories:

- Portfolio Goals
- Energy
- Water
- Materials
- Indoor Environmental Quality
- Site

The AOC's Energy and Sustainability Branch is responsible for tracking, supporting and reporting on the energy and sustainability initiatives on behalf of the agency. Performance results are detailed within Section 2: Performance Review and Annual Update.



FY 2012-2016 Sustainability Commitments

The AOC developed commitments for energy, water, materials, indoor environmental quality and site components. Each commitment is cross-referenced against required implementation elements: buildings, infrastructure and people. The check mark on the left identifies achievement of the goal at the end of FY 2015. All commitments are ongoing as the AOC continues to track progress toward 100 percent completion.



BUILDINGS



INFRASTRUCTURE



PEOPLE

PORTFOLIO GOALS*



Achieve compliance with the Guiding Principles for Sustainable Existing Buildings in 15 percent of the AOC's buildings (greater than 5,000 square feet) by the end of FY 2015.



Track and assess new construction and major renovation projects to the United States Green Building Council's Leadership in Energy and Environmental Design (LEED®) rating system by the end of FY 2014.



Track and assess 100 percent of goal-subject buildings by the end of FY 2016. Buildings will be metered for electricity, steam and chilled water; and benchmarked against current and ideal building performance models.

ENERGY



Reduce overall energy use intensity by 30 percent by the end of FY 2015.



Reduce Greenhouse Gas (GHG) Emissions (Scope 1 and 2) by 25 percent compared to the FY 2008 baseline by the end of FY 2016.

* Portfolio Goals refer to goals that can impact each of the five elements: energy, water, materials, indoor environmental quality and site. Further details and information about the goals can be found in detail within this document (page 23, *FY 2015 Program Achievements*).

WATER



Track and assess 100 percent of water use by the end of FY 2016.



Meet the Guiding Principles for Sustainable Existing Buildings for indoor and outdoor water requirements in 15 percent of AOC buildings by the end of FY 2015.

MATERIALS



Reduce, reuse or recycle at least 40 percent of **building occupant waste** by the end of FY 2016.



Reduce, reuse or recycle at least 80 percent of **construction and demolition waste** by the end of FY 2016.



Divert 90 percent of non-recyclable, building occupant waste for waste-to-energy by the end of FY 2016.



Develop an Environmentally Preferable Product Policy by the end of FY 2015.

INDOOR ENVIRONMENTAL QUALITY



Provide a comfortable and productive environment that achieves ventilation and thermal comfort levels as defined in American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 55-2004 and 62.1-2007 in 15 percent of buildings by the end of FY 2014.



Develop a Moisture Control Strategy and associated implementation strategy by the end of FY 2015.

SITE



Design new construction projects of more than 5,000 square feet that impact the surrounding site area **to meet and/or exceed stormwater regulations** by the end of FY 2016.



Where applicable, **design new landscaping projects to meet the Sustainable Sites Initiative™ (SITES) standard** by the end of FY 2016.



Where applicable, **track landscapes within the Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes** by the end of FY 2016.



Evaluate and document climate change risks and the potential impacts on the agency's mission, programs and operations by the end of FY 2016.

Section Two





The AOC in Review

10-Year Performance Summary (FY 2005-2015)

The agency's 10 year energy reduction effort exhibits a demonstrated persistence and success through its commitment toward a more sustainable future. In 2006, the AOC reduced its energy use intensity 6.7 percent from a 2003 baseline; nine years later, in FY 2015, the agency achieved a 30.9 percent reduction from its 2003 baseline and emissions were reduced 25 percent. In total, the AOC installed \$90 million in facility upgrades, identified more than \$80 million in cost avoidance and saved 600 Billion British Thermal Units (BBTUs).

In FY 2007, the AOC recycled 616 tons of building office waste* and established a goal to increase its recycling diversion rate to 31 percent by FY 2010. In FY 2015, the AOC recycled nearly 4,000 tons of office waste, achieved a 40 percent recycling diversion goal and diverted an additional 5,000 tons of construction and demolition debris.

A decade ago the AOC's buildings were unmetered. Today, the AOC has the ability to monitor building-level meters for steam, electricity, chilled water, potable water and condensate, and export meters at the Capitol Power Plant for steam and chilled water. The data populates an enterprise system, providing real-time valuable consumption metrics to energy managers and facility personnel.

The AOC is making tremendous strides in improving performance. Using its three overarching elements — buildings, infrastructure and people — as a method for developing focused initiatives, the AOC is more efficient, resiliently aware and robust than it was 10 years ago.

In FY 2015, the AOC continued to implement energy and cost savings technologies such as the installation of light emitting diode (LED) lighting and occupancy sensors throughout the House and Senate Office Buildings, Capitol Power Plant and Library Buildings and Grounds jurisdictions. The AOC successfully installed a solar photovoltaic system on the Hart Senate Office Building, the first major solar installation for the agency. These efforts realized savings through improved lighting levels, increased efficiency and decreased replacement cycles.

The AOC also faced challenges. One year ago, unusually cold weather during January through April in FY 2014, drastically impacted the agency's fuel use and, consequently, energy performance. Facing this challenge, the AOC formulated an energy recovery plan and streamlined building operations. Staff took lessons learned and made the agency act faster, smarter and more efficiently. The AOC aggressively monitored daily energy use at a granular level. This approach yielded improvements as the agency used information about hourly building performance to actively engage best practices.

*Building office waste includes paper, cardboard, bottles, cans compost and scrap metal.

In FY 2015, the AOC was one of a handful of federal agencies to successfully meet the final Energy Independence and Security Act of 2007 (EISA2007) mandate, reducing energy consumption by 30 percent.

FY 2015 Program Achievements

The following are FY 2015 program achievements, including project highlights and the pursuit of FY 2016 goals.

Goal One: Achieve compliance with the Guiding Principles for Sustainable Existing Buildings in 15 percent of the AOC's buildings (greater than 5,000 square feet) by the end of FY 2015.

High-performance buildings provide value for the taxpayer and for the public through both life-cycle cost benefits and positive effects on human health and performance. The *Guiding Principles for High-Performance and Sustainable Buildings* define minimum green building standards for federal facilities. Focus areas include reducing energy and water use, improving indoor air quality and reducing the environmental impact of materials through procurement practices and waste diversion. Compared to average buildings, high-performance buildings use less energy, water and material resources; have better indoor environmental quality; reduce air and water pollution, and produce less waste; have integrated systems; use sites well and improve conditions for the health and productivity of the buildings' occupants.

The AOC exceeded this 15 percent goal by the end of FY 2014. The AOC's efforts included the performance of air quality tests, thermal comfort surveys, water reduction of indoor and outdoor water use, benchmarking energy use and a robust recycling program.

Goal Two: Track and assess new construction and major renovation projects to the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system by the end of FY 2014.

Section 436 of the EISA2007 requires the General Services Administration (GSA) to evaluate green building certification systems every five years to identify a system and certification level "deem(ed) to be most likely to encourage a comprehensive and environmentally sound approach to certification of green buildings."

In October 2013, GSA recommended that agencies use one of two green building certification systems that best suit agency missions and portfolio needs: the Green Building Initiative's Green Globes® and the U.S. Green Building Council's Leadership in Energy and Environmental Design® (LEED).

To meet this goal, the AOC established a guideline of silver level certification for new construction from the LEED Green Building Rating System. The LEED rating system, created by the U.S. Green Building Council, consists of a series of building design and operational

practices, prerequisites and optional credit points for green site and building strategies. The rating system is based on a numeric point system, with certifications awarded to buildings that exhibit good-to-high environmental performance.

The AOC's Design Guide requires all new construction and major renovations to be designed to meet LEED silver certification performance standards. This year, the Cannon House Office Building Renewal Project commenced with the initial work concentrating on the historic building's utilities and infrastructure. The project is pursuing LEED gold certification.

Goal Three: Track and assess 100 percent of goal-subject buildings by the end of FY 2016. Buildings will be metered for electricity, steam and chilled water; and benchmarked against current and ideal building performance models.

Section 8253 of EISA2007 required all federal agencies to be metered by October 1, 2012, for the purposes of efficient use of energy and reduction in the cost of electricity used. Section 434 further states that each agency shall provide for equivalent metering of natural gas and steam, no later than October 1, 2016. Such data shall be incorporated into existing energy tracking systems and made available to federal facility managers. In addition to the above requirements, the AOC's FY 2016 goal includes metering of chilled water.

The AOC's metering program includes building-level meters for steam, electricity, chilled water, potable water and condensate and export meters at the Capitol Power Plant for steam and chilled water.

The AOC's advanced meter program includes building-level utility meters that are connected to the AOC's campus-wide building automation system. The Building Automation System Network (BASnet) feeds 15-minute data to the Utility Metering Enterprise System (UMES) where it can be easily compiled and graphically displayed. This data also supports the AOC's Bill Verification System (BVS) — a program that analyzes utility bills. The AOC compares its real-time data against ideal performance models to capture insights on performance.

Goal Four: Reduce overall energy use intensity by 30 percent by the end of FY 2015.

In accordance with EISA2007, the AOC applied aggressive standards to reduce energy use by 3 percent annually from FY 2003 levels, yielding a 30 percent total reduction by FY 2015. The AOC exceeded this requirement with a 30.9 percent reduction.

The AOC's program methodology evolved over time, from the installation of advanced metering, energy assessments and modeling; progressing to retro-commissioning, system balancing and formulating benchmarks; and finally, establishing annual performance targets and leveraging data analytics for ongoing performance monitoring.

PROJECT HIGHLIGHT

Hart Senate Office Building Roof and Skylight Replacement

The Senate Office Buildings jurisdiction received funding to address the Hart building's roof system. The original roof and skylights had reached the end of their useful life and, over time, water infiltration had caused damage to the building.

During early planning, the team initiated a study with the Department of Energy to assess the viability of installing solar panels on the Hart roof in conjunction with the replacement project.

The team walked through a number of options, first analyzing a combination green roof and photovoltaic design. The return on investment was determined to be positive for a solar photovoltaic installation, and the team was asked to develop a new design maximizing solar photovoltaic square footage.

The AOC installed a 148-kilowatt photovoltaic system. The solar panels will decrease utility use, increase sustainability and make the Senate Office Buildings eligible for an energy credit program that will further reduce electrical costs.

More information is available at:
www.aoc.gov/projects/hart-roof



At top: Mr. Ayers providing a tour of the AOC's solar photovoltaic system on the Hart Building. At bottom: The AOC's Hart Building Roof and Skylight Replacement team.

PROJECT HIGHLIGHT

Water Savings at Neptune Fountain

The AOC provides ongoing care and maintenance for 34 water features across the Capitol campus. In FY 2015, the Library Buildings and Grounds team initiated a project at the prestigious Court of Neptune Fountain.

During routine maintenance, the team identified an opportunity to improve water efficiency. George Whiting, who cares for the fountain as part of his regular duties, and his colleagues raised the overflow tubes and added valves including an automatic valve with a timer. As a result, demand for makeup water was substantially reduced. The effort equated to 3 million gallons of water saved (or a 29 percent reduction from its FY 2014 use). The cost savings is approximately \$46,000 annually.

Routine maintenance practices and ongoing infrastructure projects help locate problems quickly, keep equipment at peak efficiency and maximize results for the AOC's water management program.



At top: The AOC's Library Buildings and Grounds team member, George Whiting, plumber for the Neptune Fountain.
At bottom: The Library Buildings and Grounds Neptune Fountain team.

The following are the AOC's most impactful program elements in meeting the EISA2007 mandate:

- **Energy Savings Performance**

Contracts — In 2008, the AOC initiated several Energy Savings Performance Contracts (ESPC), providing more than \$90 million in energy upgrades in the U.S. Capitol, Senate and House office buildings. The work included the expansion of the AOC's BASnet which resulted in improved environmental control and occupant comfort, as well as alarming, trending and advanced control capabilities that did not previously exist. Annual cost avoidance is approximately \$9 million, with the majority of the savings coming from heating, ventilation and air conditioning (HVAC) system upgrades, optimized control strategies and lighting system retrofits.

- **Energy Audits** — The AOC completed comprehensive energy assessments that documented facility energy performance, provided calibrated lighting and HVAC models and identified energy conservation measures (ECMs) for facilities. ECMs are incorporated into jurisdictional operations and maintenance or minor construction programs, campus-wide initiatives or bundled into larger energy projects toward AOC-wide energy use reductions.
- **Retro-Commissioning** — In FY 2011, the AOC initiated a retro-commissioning program to address ongoing performance issues with its largest energy end-user, HVAC systems. The program isolated and corrected malfunctioning devices, sensors out of calibration and faulty control logic and quantified the associated energy savings. As part of the program's efforts, energy conservation measures such as automating manual operations and improved control strategies were identified, with the majority of the paybacks under five years.
- **Performance Monitoring** — The AOC invested in performance monitoring once facilities were converted to direct digital control (DDC). The performance monitoring system mines data from the AOC's BASnet and utility metering systems, compares it to a set of rules or conditions, performs in-depth time and event-based analysis, identifies equipment operating outside of optimum parameters and recommends corrective actions. The AOC

FIGURE 3: FY 2015 ENERGY CONSUMPTION BY CATEGORY

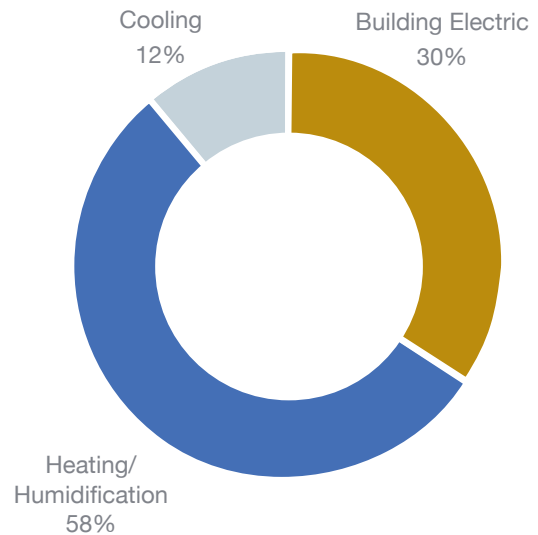


Figure 3 illustrates the AOC's total energy use by category in FY 2015.

uses this system to validate the performance of the ESPCs and to ensure energy-efficient operations are maintained or further optimized.

- **Training** — The AOC launched comprehensive HVAC training focused on building performance to ensure the persistence of energy savings achieved through system and buildings optimization.

Goal Five: Reduce Greenhouse Gas (GHG) Emissions (Scope 1 and 2*) by 25 percent compared to the FY 2008 baseline by the end of FY 2016.

This goal aligns with the AOC's energy reduction and benchmarking strategies — as energy use declines, GHG emissions follow suit. While the AOC participates in the purchase of renewable energy certificates, it does not attribute renewable energy certificates to the reductions of its overall greenhouse gas emissions footprint.

The AOC met this requirement in FY 2015 with a 25 percent reduction of its greenhouse gas footprint from a FY 2008 baseline. These reductions equate to taking 15,158 passenger vehicles off the road.

Goal Six: Track and assess 100 percent of water use by the end of FY 2016.

To meet this goal, the AOC is conducting comprehensive water evaluations across the Capitol campus. The agency is focused on installing water meters and working to reconcile water usage. The AOC's steps to analyze water use through a variety of systems and practices, will lead to monthly water progress reports. In FY 2013, the AOC created a *Water Management Plan* to identify best practices and products based upon previously conducted water conservation studies.

Goal Seven: Meet the Guiding Principles for Sustainable Existing Buildings for indoor and outdoor water requirements in 15 percent of AOC buildings by the end of FY 2015.

The Guiding Principles establish goals for both indoor and outdoor water-use; therefore, the AOC approaches water use strategies from two perspectives: building and infrastructure improvements. At the infrastructure level, the AOC is responsible for 553 acres of land. This goal applies to external water activities: external management planning, water use monitoring, and education and landscaping needs.

In FY 2015, the AOC renewed its focus on building and landscape water use. This goal remains one of the agency's more sizeable challenges. The AOC is committed to reducing water usage, and capturing and reusing water where possible. This fiscal year, the AOC reduced its water use intensity (gallons per square foot) by 34 percent, meeting the FY 2015 goal.

*Scope 1 includes emissions from burning fuel and Scope 2 includes indirect emissions from purchased electricity, steam and hot water.

PROJECT HIGHLIGHT

A Passion for Pedaling

After much dedication and hard work, the AOC's Bicycle Advisory Committee (BAC) was elated this past summer when the League of American Bicyclists designated the AOC a Bronze Level Bicycle Friendly Business. The League of American Bicyclists recommends that businesses focus on the "5 E's: Engineering, Education, Encouragement, Enforcement, and Evaluation and Planning."

The BAC initially focused on education with numerous articles on everything from different rules of the road to fun stories of family rides. It hosts a variety of classes offering practical advice and detailed instruction on biking and basic bike maintenance.

To encourage more riding, the BAC hosts monthly bike rides to interesting and educational areas of the city. A notable success of the BAC is the relaunch of the Interagency Federal Bike Working Group with the goal of sharing best practices and encouraging biking throughout the federal workforce.

The BAC successfully installed bicycle maintenance stands in three garages and was able to get bicycle lanes added on some of the streets surrounding the U.S. Capitol.

Check out this article, "*A Passion for Pedaling*" on the AOC's blog: www.aoc.gov/blog.



Above: The AOC's Bicycle Advisory Committee sponsored a "Bike to Work Day" event for FY 2015.

Goal Eight: Reduce, reuse or recycle at least 40 percent of building occupant waste by the end of FY 2016.

Resource conservation is a critical component of the AOC's Strategic Vision and aligns with the agency's mission of historic preservation. The AOC retains and maintains historic architectural elements and furniture to facilitate a long, useful life.

Expanding upon those practices, the AOC prioritizes waste source reduction strategies. Measures include double-sided printing, electronic dissemination of information and refurbishing broken equipment. When materials must be disposed, the AOC encourages recycling by making bins easily accessible for paper, plastic and other consumables and implements a program for ink cartridges, computer equipment and certain industrial materials.

In FY 2015, the AOC achieved a 46 percent recycling rate, exceeding the FY 2016 goal. The AOC's jurisdictions track the agency's recycling program through its Sustainability Information Management System (SIMS). The system makes data accessible for staff to identify specific opportunities for improved waste reduction.

Goal Nine: Reduce, reuse or recycle at least 80 percent of construction and demolition waste by the end of FY 2016.

The AOC strives to divert at least 80 percent of construction and demolition waste from landfills through source reduction, recycling and reuse. Waste diversion generates a host of environmental, financial and social benefits, including conserving energy and natural resources, reducing disposal costs and lessening the burden on landfills and other waste disposal methods.

The AOC's construction waste is derived from internal AOC construction efforts and larger contracted work. The AOC also encourages waste diversion through the development of AOC protocols, including contract language about waste management for projects and requirements for contractor-developed waste management plans.

In FY 2015, the AOC achieved a 90 percent recycling rate for construction and demolition, exceeding the FY 2016 goal.

Goal Ten: Divert 90 percent of non-recyclable, building occupant waste for waste-to-energy by the end of FY 2016.

Items identified as non-recyclable are tracked and sent to a waste-to-energy facility. Waste-to-energy refers to the burning of solid wastes to generate heat and, in turn, the process produces steam and electricity. This process creates usable energy — employing waste that would otherwise be placed in landfills. Diverting up to 90 percent of the Capitol campus' non-recyclable solid waste is designed to complement, and not compete with, ongoing, robust recycling programs. In FY 2015, the AOC achieved an 86 percent recycling rate for waste-to-energy. The AOC tracks the agency's waste-to-energy program through SIMS.

POWER TO SAVE

Outreach Toward an Energy Milestone

In FY 2012, the AOC strengthened its sustainability goals through employee engagement and improved outreach. Efforts included the introduction of the AOC's "Power to Save" campaign. Behind this initiative was the understanding that simple individual actions can add up to a tremendous collective energy savings. "Power to Save" was designed to educate staff, employees and visitors about energy and water efficiency, preservation, waste management, indoor air quality, transportation and other key sustainability issues.

The AOC reduced its energy usage by nearly 31 percent through FY 2015, exceeding the federally mandated energy reduction target of 30 percent. This milestone could not have been met without Congress' support, which helped the AOC implement a variety of projects designed to save taxpayer dollars and conserve natural resources.



Power to Save

The initiative focused on:



Technology: Power off personal electronics and devices.



Last Out Policy: Turn off building lights, computers and copiers and close windows.



Minimize Printing: Print double-sided and use recycled paper.



Occupancy Sensors: Install sensors to automatically adjust systems.



Recycle: Recycle paper and other office materials.



Energy Star: Purchase Energy Star-certified office equipment.

More information is available at: www.aoc.gov/power-save

Goal Eleven: Develop an Environmentally Preferable Product Policy by the end of FY 2015.

The AOC created policy, guidance and specifications to address the purchase of a wide variety from large construction materials to daily consumables.

The AOC's Environmental Manual addresses requirements for an Environmentally Preferable Purchasing Program for biobased and recycled-content products; additionally, as part of its overall building management plans, the AOC developed sustainable purchasing and green cleaning guidance. Environmentally preferable products are processed from recycled materials, use fewer resources, are low-emitting, eliminate the need for ozone-depleting substances or materials with hazardous or toxic content, and have a positive impact on the AOC's environmental footprint.

In conjunction with these efforts, the agency is committed to developing an Environmentally Preferable Procurement Plan to further guide purchasing decisions throughout the AOC to ensure that new material acquisitions consider the most sustainable options.

To ensure the environmental performance of certain materials on construction and renovation projects, the AOC developed sustainable design specifications. These standards define the criteria for Divisions 01-33 and align with the AOC's environmental manual and building management plans.

Goal Twelve: Achieve ventilation and thermal comfort levels as defined in the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) 55-2004 and 62.1-2007 in 15 percent of buildings by the end of FY 2014.

Building performance should account for impacts on the health, comfort and productivity of its occupants. The AOC is dedicated to providing functional and healthy accommodations within its buildings. The agency is working to ensure it delivers these qualities through the implementation of its building management plans, design guidelines, policies and audit programs. Key measures for a healthy building include ventilation, thermal comfort and moisture, as defined in ASHRAE standards, as well as adequate lighting controls to accommodate occupant needs.

The AOC conducted detailed assessments in several facilities to confirm that the buildings were meeting the air quality requirements of the Guiding Principles, in accordance with ASHRAE standards 55-2004 and 62.1- 2007. The agency benchmarks indoor conditions and monitors occupant feedback for all facilities through the AOC's Executive Dashboard. These efforts sufficiently met the requirements for this goal by the end of FY 2014.

In FY 2015, the AOC launched new efforts to address room temperature issues, including proactive visits to Senate and House congressional offices to identify issues before they became complaints. For example, supervisors and mechanics visited offices during the congressional transition to explain how the new thermostats operated and adjusted the settings to meet the clients' comfort requirements.

PROJECT HIGHLIGHT

One Team, One Energy Reduction Mission

The AOC achieved an extraordinary goal at the end of FY 2015 — successfully meeting the mandate to reduce energy consumption by more than 30 percent from our 2003 baseline.

Doug Helmann, former Deputy Chief Sustainability Officer in the Energy, Sustainability and Water Conservation Division and now Assistant Superintendent of the Library Buildings and Grounds jurisdiction, described the AOC's formula for success, "Our approach to sustainability and energy on Capitol Hill is built upon three defining elements... buildings, infrastructure and people."

The enhanced technology components of our infrastructure and building upgrades provided new tools to improve our energy use decision-making and efficiency. Additionally, our people have adopted these new technologies. We use energy data and advanced control systems to solve complex issues and drive efficiency improvements. AOC jurisdictions are critical to the success of the agency's sustainability and energy goals because of their on-the-ground access to stakeholders, staff, processes and building systems.

As we continue to focus on saving energy, practicing sustainability and reducing costs, our next goal is to achieve energy savings of 2 percent per year over the next 10 years.

"It's an ambitious goal, but I know we are up for the challenge," said Terry Watson, Acting Assistant Director for Energy and Sustainability. "When we achieve it, we will be 50 percent below our 2003 baseline."

Buildings

Energy Savings Performance Contracts (ESPCs), which use private funding to accelerate investment in energy conservation measures, enabled the AOC to make significant upgrades to its infrastructure with minimal capital investment. The AOC entered into three ESPCs — in the Capitol, House and Senate jurisdictions — which were an important element in our strategy to reduce energy consumption by 30 percent within 10 years.

One of the key energy-saving initiatives in the Senate Office Buildings is an emphasis on energy-efficient lighting. Over the past several years, nearly 44,000 lighting fixtures in the Senate buildings were retrofitted with high-efficiency lamps, ballasts, controls and reflectors — resulting in an estimated annual savings of nearly \$750,000.

The Rayburn House Office Building needed a new roof, and in FY 2011, the AOC took the opportunity to install a new "cool roof." A cool roofing system helps reduce the amount of cooling needed in the summer because it reflects light instead of absorbing it. This means that less heat is transferred into the building below, which helps keep the interior spaces cooler — and that equates to cost savings.

The U.S. Capitol is one of the most familiar sights in the world. It's a symbol of our democracy and it is filled with historic art. It houses Congress and has high-volume public access in addition to tight security. Those are just some of the challenges faced when trying to reach 21st century standards of energy and sustainability. Amazingly, the Capitol Building had an energy reduction of 29 percent over a 10-year term. Upgrading the HVAC controls, converting the air handling units to direct digital control, switching to energy-efficient lighting and replacing steam traps are some of the major projects that helped us reach our energy reduction goals.

Infrastructure

The majority of the energy at the Capitol Power Plant (CPP) is used to create the steam and chilled water to heat and cool the buildings throughout the Capitol campus. A series of tunnels deliver steam and chilled water to locations as far out as Union Station and the Government Publishing Office. Small improvements to the production distribution efficiency of steam and chilled water can have great energy conservation impacts.

The CPP made dramatic performance improvements in the generation and delivery of chilled water and steam throughout our facilities. By revitalizing the refrigeration plant and installing new chillers, the CPP increased chilled water efficiency with new chillers that are 20 percent more efficient. These chillers aren't small — as one can use more electricity than the Rayburn Building or Hart Building on the busiest day of the year.

During the summer of 2012, there was an unexpected increase in steam energy use, which risked the AOC's ability to meet its FY 2012 energy reduction goal. We instituted a steam reduction challenge and jurisdictions came together to meet both the goal and the needs of the building occupants. The AOC's web-based meter reading systems identified unseen issues and ideas and lessons learned were shared across the campus.

AOC staff play a crucial role in using equipment and system upgrades to maximize energy savings, increase occupant comfort and identify additional energy-saving opportunities. The AOC, through its operations teams across the agency, focus on streamlining operating procedures and sustaining energy savings.

Check out this article, "*One Team, One Energy Reduction Mission*" on the AOC's blog: www.aoc.gov/blog

FIGURE 4: MONTHLY ENERGY PERFORMANCE ENERGY REDUCTION THROUGH FY 2015

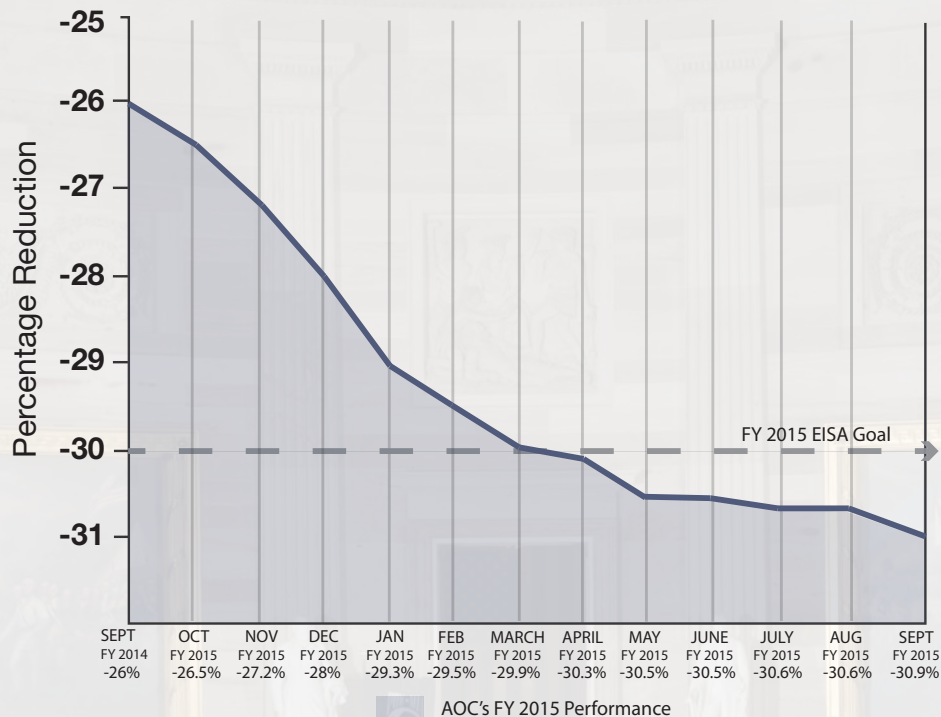


Figure 4 illustrates the AOC's monthly energy performance toward the FY 2015 EISA2007 goal. One year ago, unusually cold weather drastically impacted the agency's FY 2014 fuel use and, consequently, energy performance. Facing this challenge, the AOC formulated an energy recovery plan and streamlined building operations. Staff took lessons learned and made the agency act faster, smarter and more efficiently. In FY 2015, the AOC met its target. The energy reduction target was 30 percent and the AOC achieved a savings of 30.9 percent.

Goal Thirteen: Develop a moisture control strategy and associated implementation strategy by the end of FY 2015.

The AOC successfully met the intent of this goal through its design, maintenance and operational strategies and practices. The AOC employs moisture-control principles for design and operations. The agency's design guide provides prescriptive requirements to control liquid, prevent excessive indoor humidity and water vapor migration and select moisture-resistant materials for projects. The AOC's scorecard addresses the implementation of those moisture-control strategies during design, construction and renovation. During operations, jurisdiction teams regularly test piping equipment and work to actively prevent moisture damage from occurring.

Goal Fourteen: Design new construction projects of more than 5,000 square feet that impact surrounding site area to meet and/or exceed stormwater regulations by the end of FY 2016.

It is the AOC's goal to exceed stormwater requirements when feasible. The AOC's Stormwater Pollution Prevention and Management Plan for the Capitol and surrounding facilities details utility infrastructure, topographic and hydrologic information, and meets District of Columbia 2013 stormwater regulations. The plan serves as guidance for creative stormwater management techniques that are both respectful of the historical integrity of the Capitol campus and responsive to regulatory requirements. Recommendations included in the plan focus on money-saving efforts to reduce potable water demand and stormwater fees.

In support of this goal, the AOC conducts outreach, education and operational reviews to identify opportunities to meet its stormwater requirements. These methods include educational lunch and learns, webinars and guidance materials.

Goal Fifteen: Where applicable, design new landscaping projects to meet the Sustainable Sites Initiative standard by the end of FY 2016.

At the AOC, sustainable landscape practices extend beyond the Capitol. For example, the U.S. Botanic Garden is a partner in the Sustainable Sites Initiative (SITES™). SITES was created by the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center at The University of Texas at Austin and the U.S. Botanic Garden. Similar in concept to the U.S. Green Building Council's LEED® rating system for green buildings, the program consists of voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices in areas of open space.

An updated version of SITES is expected by the end of FY 2016. Once finalized, the AOC intends to evaluate the feasibility of implementing the standards for new construction projects throughout the agency.

*The LEED rating system consists of a series of building design and operational practices, prerequisites and credits for green site and building strategies. The rating system is based on a numeric point system, with certifications awarded to buildings that exhibit good-to-high environmental performance.

PROJECT HIGHLIGHT

Sustainable Sites v2 Rating system and Reference Guide Released

During FY 2015, the U.S. Botanic Garden (USBG) helped complete the Sustainable Sites Initiative (SITES) v2 Rating System (and Reference Guide) for use by landscape architects, designers, engineers and others who work in land design and development.

In addition, USBG and its partners turned over the management of the SITES program to the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Green Building Rating Systems.

Developed over seven years, SITES v2 is the most comprehensive sustainable landscape design certification program in the nation and is having a transformative effect on U.S. horticultural practices. It is a voluntary rating system that provides best practices, performance benchmarks and tools for creating and evaluating sustainable landscapes. The SITES program began as an interdisciplinary collaboration of the USBG, the Lady Bird Johnson Wildflower Center at the University of Texas at Austin, the American Society of Landscape Architects and a large group of technical volunteers.

Green Building Council staff and technical advisors informed the development of the SITES v2 Rating System and, looking ahead, the Council encourages projects to pursue simultaneous certification with the LEED and SITES v2 Rating Systems.

At the AOC, USBG's Bartholdi Park is being redesigned as a Sustainable Sites Initiative using SITES v2. Bartholdi Park will include demonstration gardens for homeowners using SITES guidelines. Each demonstration will be a synergistic solution, helping improve home garden design and maintenance practices nationwide.

More information is available at: www.usbg.gov/sites



In addition to the formal program, a working group coordinated by the U.S. Botanic Garden developed guidance to improve the sustainability of federal landscape practices. The guidance helps achieve the policy goals set by Executive Order 13514 and adheres to the principles within the SITES rating system. The AOC recognizes the potential environmental impact of landscaping practices by federal agencies; thereby, where feasible, existing landscapes shall incorporate strategies within the Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes.

Goal Sixteen: Where applicable, track landscapes within the Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes by the end of FY 2016.

Through its daily care, improvement, maintenance and preservation, the AOC has a unique opportunity to sustainably impact the Capitol campus. The AOC is responsible for approximately 580 acres.

Through the AOC's integrated design process, project teams examine the opportunity for applying sustainable design strategies into landscape projects. The AOC's sustainable scorecard identifies and expands on the elements of opportunity.

The U.S. Capitol Grounds jurisdiction (Capitol Grounds) has also recently formalized its commitment to sustainability by incorporating the priority of sustainable practices into its mission statement, as well as including an objective in its first strategic plan to "further sustainable practices" under the goal of "attaining organizational excellence to maintain an awe-inspiring setting for the U.S. Capitol." Capitol Grounds is responsible for approximately 275 acres of the AOC's total footprint, the largest of any AOC jurisdiction.

In FY 2016, Capitol Grounds will introduce an internal document, the Sustainability Management Plan, to further realize this vision by solidifying a comprehensive catalog of sustainability goals and by catalyzing action on the path to more sustainable systems.

Goal Seventeen: Evaluate and document climate change risks and the potential impacts on the agency's mission, program and operations by the end of FY 2016.

As the caretaker of the buildings on Capitol Hill, the AOC seeks to understand and document intersecting risks from its surrounding infrastructure, building operations and potential vulnerabilities of the AOC's mission and programs. For instance, a building-level analysis may include an understanding of increased severe weather events and their impact on indoor air quality, the health of its spaces or security infrastructure.

Through a collaborative and integrated effort, it is the intent of the AOC to be more aware of the climate change risks to its buildings and the appropriate adaptation measures that should be executed for future development under the stewardship of the AOC. The Government Accountability Office identified climate change on its 2013 list of items presenting high risk to the federal government.

FY 2015 Financial Review

The AOC implemented a series of investments in technology and enhanced building improvements that changed the way congressional buildings operate. These efforts ensured high-quality service while lowering operating costs. The buildings on Capitol Hill are less expensive to heat, cool and light than ever before; similarly, indirect savings have improved water efficiency and streamlined recycling activities.

The economic argument for energy and sustainability is compelling. By implementing the principles of MEASURE, COMPARE, IMPROVE, the AOC saved more than one dollar per square foot in energy costs — avoiding \$17 million in utility payments that would have occurred had the agency continued to operate in a less-efficient manner — while also giving AOC staff the tools to consistently maintain those savings.

FIGURE 5: MAJOR SOURCES OF COST SAVINGS FY 2015 ENERGY BREAKOUT

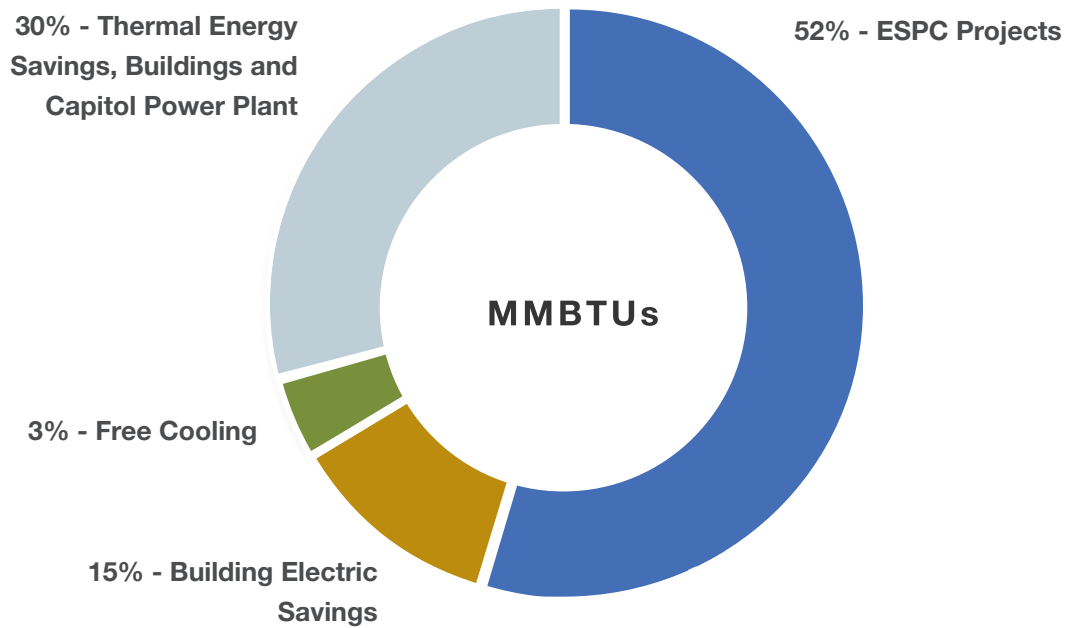


Figure 5 shows the FY 2015 breakout of sources for energy savings. These energy savings translate to an annual cost avoidance of more than \$17 million.

The most impactful energy conservation efforts included infrastructure and performance improvements at the CPP and building efficiency improvements made during the three ESPCs.

CPP projects continue to generate electricity and fuel savings. The AOC completed the chiller and cooling tower phase of the CPP's West Refrigeration Plant Revitalization Program, a project that helps increase CPP cooling plant efficiency and provides an opportunity for significant cost avoidances. These efficiency improvements translate into financial savings as less electricity is needed to meet campus cooling needs.

Another example is the thousands of devices installed throughout the Capitol campus to provide real-time space conditions. AOC staff uses this information to proactively ensure proper operation and increase client satisfaction while also saving energy. When the spaces are unoccupied, these sensors provide feedback to our building automation systems, resulting in substantial performance improvements.

Looking ahead, the AOC will continue to use ESPCs to finance needed improvements for its long-term energy performance plan. In the future, the Library Buildings and Grounds jurisdiction will explore whether to use an ESPC to fund needed energy and water improvements for its facilities. This ESPC would allow the AOC to implement energy-savings measures with minimal up-front investment.

The integration of energy-savings components into existing construction projects helps the AOC leverage project investments to further augment its energy efforts. The AOC enhanced its buildings and infrastructure during the past 10 years. Now building and plant operators have the tools and data to leverage and improve customer service while saving additional resources. By improving the information available, the AOC makes earlier, better-informed decisions surrounding energy and water management.

Looking Ahead

Currently, there is no legislated energy reduction goal for federal buildings in FY 2016 and subsequent years. Absent new legislative mandates, the AOC remains committed to sustainability and will continue reducing its energy consumption by 2 percent annually, or an aggregate of 20 percent by the end of FY 2025, using the AOC's FY 2003 energy baseline (figure 6, page 42). In FY 2016, the energy reduction goal is 32 percent.

Making the buildings and grounds of Congress and the Supreme Court as energy- and water-efficient as possible is smart business. Programs such as recycling, energy-efficient lighting, water conservation and green building design reduce environmental impacts and decrease future operating costs. It is the AOC's intent to implement innovative sustainability strategies that achieve these goals and uphold the mission of the agency.

Looking ahead, the AOC will focus on the following elements in pursuit of its commitments:

- In support of climate resilience, the AOC will evaluate and document climate change risks and the potential impacts on the agency's mission, programs and operations by the end of FY 2016.
- The AOC will strengthen its waste reduction and recycling program. For materials, the AOC's goal is to divert 40 percent of building occupant waste and 80 percent of construction and demolition waste.
- The AOC will continue its momentum to make water a future priority by working to track and assess 100 percent of its water use by the end of FY 2016. This includes an increase in sub-metering on major end users.
- The AOC will oversee the installation of an energy-efficient cogeneration system at the Capitol Power Plant. Cogeneration will use natural gas to simultaneously produce electricity and heat.
- The AOC will focus on converting legacy pneumatic control systems to direct digital controls for major handling units.
- The AOC will commit to new sustainability and energy goals for Fiscal Years 2017-2021. These commitments will continue to address energy and water reductions, sustainable resource management, indoor environmental quality, site impacts and the long-term resilience of our national treasures.

FIGURE 6: FUTURE ANNUAL ENERGY REDUCTIONS LOOKING AHEAD FY 2016-2025

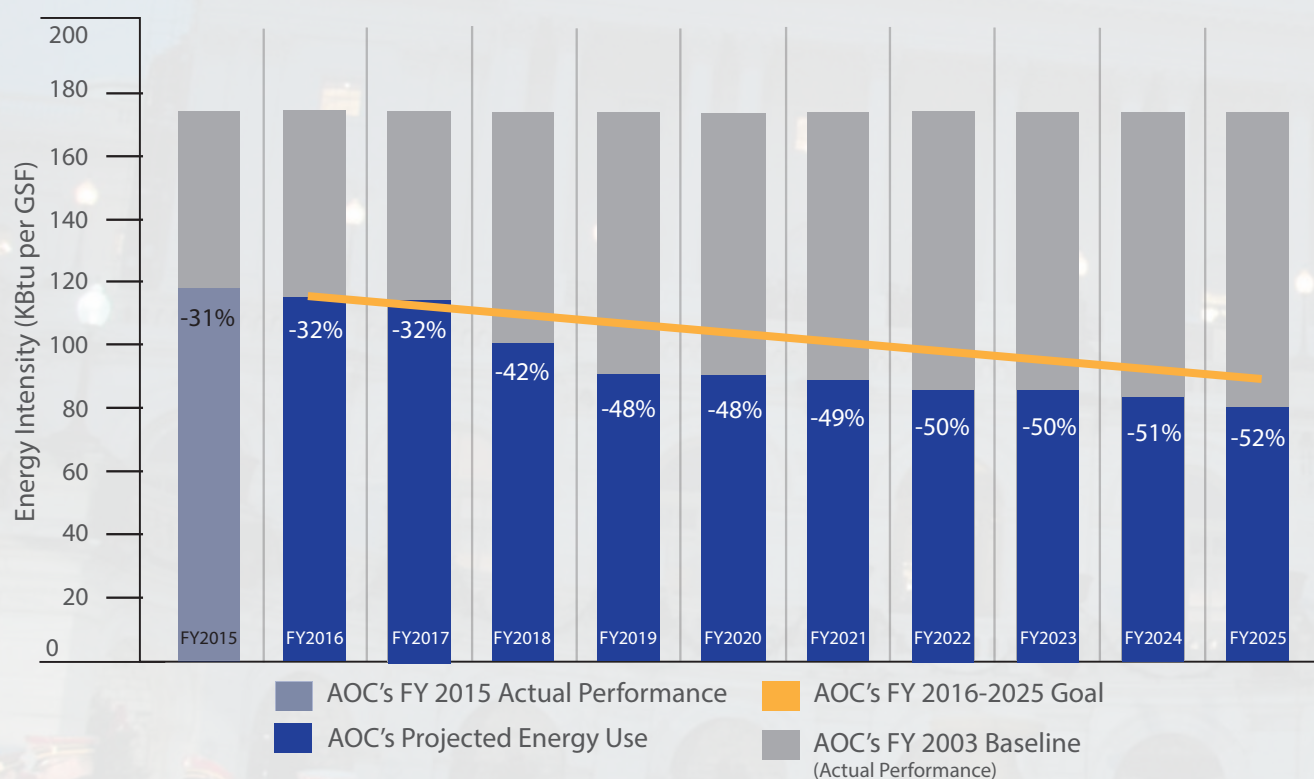


Figure 6 illustrates the AOC's projected energy performance for FY 2016-2025. The Energy Independence and Security Act of 2007 (EISA2007) required the AOC to reduce its energy consumption an aggregate of 30 percent for FY 2006-2015, using the AOC's FY 2003 energy baseline. EISA2007 established aggressive building performance standards, and the AOC exceeded this requirement (AOC's FY 2015 actual performance).

The gold line represents the AOC's FY 2016-2025, 2 percent energy reduction goal. The light blue represents the AOC's actual FY 2015 performance, a reduction of 31 percent from its 2003 baseline. The dark blue represents the AOC's *projected* energy use reduction based on major initiatives that could contribute to the new reduction goal.







Appendix



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Congressional Directives

Energy Policy Act (EPAct2005) OF 2005

PUBLIC LAW (PL) 109-58, SECTIONS 101 AND 1829 Public Law 109-58

Section 101. Energy and Water Saving Measures in Congressional Buildings

The Architect of the Capitol—

(1) shall develop, update, and implement a cost-effective energy conservation and management plan (referred to in this section as the ‘plan’) for all facilities administered by Congress (referred to in this section as ‘congressional buildings’) to meet the energy performance requirements for Federal buildings established under section 543(a)(1); and

(2) shall submit the plan to Congress, not later than 180 days after the date of enactment of this section.

(b) Plan Requirements—The plan shall include:

(1) a description of the life cycle cost analysis used to determine the cost effectiveness of proposed energy efficiency projects;

(2) a schedule of energy surveys to ensure complete surveys of all congressional buildings every 5 years to determine the cost and payback period of energy and water conservation measures;

(3) a strategy for installation of life cycle cost-effective energy and water conservation measures;

(4) the results of a study of the costs and benefits of installation of sub metering in congressional buildings; and

(5) information packages and ‘how-to’ guides for each Member and employing authority of Congress that detail simple, cost-effective methods to save energy and taxpayer dollars in the workplace.

(c) ANNUAL REPORT—The Architect of the Capitol shall submit to Congress annually a report on congressional energy management and conservation programs required under this section that describes in detail—

(1) energy expenditures and savings estimates for each facility;

(2) energy management and conservation projects; and

(3) future priorities to ensure compliance with this section.

SEC 1829: The Architect of the Capitol, as part of the process of updating the Master Plan Study for the Capitol complex, shall—

(1) carry out a study to evaluate the energy infrastructure of the Capitol complex to determine how to augment the infrastructure to become more energy efficient.

(A) by using unconventional and renewable energy resources;

(B) by (i) incorporating new technologies to implement effective green building solutions; (ii) adopting computer-based building management systems; and (iii) recommending strategies based on end-user behavioral changes to implement low-cost environmental gains; and

(C) in a manner that would enable the Capitol complex to have reliable utility service in the event of power fluctuations, shortages, or outages;

(2) carry out a study to explore the feasibility of installing energy and water conservation measures on the rooftop of the Dirksen Senate Office Building, including the area directly above the food service facilities in the center of the building, including the installation of—

(A) a vegetative covering area, using native species to the maximum extent practicable, to—(i) insulate and increase the energy efficiency of the building; (ii) reduce precipitation runoff and conserve water for landscaping or other uses; (iii) increase, and provide more efficient use of, available outdoor space through management of the rooftop of the center of the building as a park or garden area for occupants of the building; and (iv) improve the aesthetics of the building; and

(B) onsite renewable energy and other state-of-the art technologies to—

(i) improve the energy efficiency and energy security of the building or the Capitol complex by providing additional or backup sources of power in the event of a power shortage or other emergency; (ii) reduce the use of resources by the building; or (iii) enhance worker productivity; and

(C) not later than 180 days after the date of enactment of this Act, submit to Congress a report describing the findings and recommendations of the study under subparagraph (B).

(b) **AUTHORIZATION OF APPROPRIATIONS**—There is authorized to be appropriated to the Architect of the Capitol to carry out this section \$2,000,000 for each of fiscal years 2006 through 2010.

Energy Independence and Security Act of 2007 (EISA2007), SECTIONS 431, 501, 502, 503, 504

TITLE V—Energy Savings in Government and Public Institutions

Subtitle A—United States Capitol Complex

SEC. 431. Energy Reduction Goals for Federal Buildings.

Section 543(a)(1) of the National Energy Conservation Policy Act (42 U.S.C. 8253(a)(1)) is amended by striking the table and inserting the following:

“Fiscal Year Percentage Reduction

2006	2
2007	4
2008	9
2009	12
2010	15
2011	18
2012	21
2013	24
2014	27
2015	30

SEC. 501. Capitol Complex Photovoltaic Roof Feasibility Studies

(a) **STUDIES**—The Architect of the Capitol may conduct feasibility studies regarding construction of photovoltaic roofs for the Rayburn House Office Building and the Hart Senate Office Building.

(b) **REPORT**—Not later than 6 months after the date of enactment of this Act, the Architect of the Capitol shall transmit to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Rules and Administration of the Senate, a report on the results of the feasibility studies and recommendations regarding construction of photovoltaic roofs for the buildings referred to in subsection (a).

(c) **AUTHORIZATION OF APPROPRIATIONS**—There is authorized to be appropriated to carry out this section \$500,000.

SEC. 502. Capitol Complex E-85 Refueling Station

- (a) CONSTRUCTION—The Architect of the Capitol may construct a fuel tank and pumping system for E-85 fuel at or within close proximity to the Capitol Grounds Fuel Station.
- (b) USE—The E-85 fuel tank and pumping system shall be available for use by all legislative branch vehicles capable of operating with E-85 fuel, subject to such other legislative branch agencies reimbursing the Architect of the Capitol for the costs of E-85 fuel used by such other legislative branch vehicles.
- (c) AUTHORIZATION OF APPROPRIATIONS—There is authorized to be appropriated to carry out this section \$640,000 for fiscal year 2008.

SEC. 503. Energy and Environmental Measures in Capitol Complex Master Plan

- (a) IN GENERAL—To the maximum extent practicable, the Architect of the Capitol shall include energy efficiency and conservation measures, greenhouse gas emission reduction measures, and other appropriate environmental measures in the Capitol Complex Master Plan.
- (b) REPORT—Not later than 6 months after the date of enactment of this Act, the Architect of the Capitol shall submit to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Rules and Administration of the Senate, a report on the energy efficiency and conservation measures, greenhouse gas emission reduction measures, and other appropriate environmental measures included in the Capitol Complex Master Plan pursuant to subsection (a).

SEC. 504. Promoting Maximum Efficiency in Operation Of Capitol Power Plant

- (a) STEAM BOILERS—
 - (1) IN GENERAL—The Architect of the Capitol shall take such steps as may be necessary to operate the steam boilers at the Capitol Power Plant in the most energy efficient manner possible to minimize carbon emissions and operating costs, including adjusting steam pressures and adjusting the operation of the boilers to take into account variations in demand, including seasonality, for the use of the system.
 - (2) EFFECTIVE DATE—The Architect shall implement the steps required under paragraph (1) not later than 30 days after the date of the enactment of this Act.
- (b) CHILLER PLANT—
 - (1) IN GENERAL—The Architect of the Capitol shall take such steps as may be necessary to operate the chiller plant at the Capitol Power Plant in the most energy efficient manner possible to minimize carbon emissions and operating costs, including

adjusting water temperatures and adjusting the operation of the chillers to take into account variations in demand, including seasonality, for the use of the system.

(2) **EFFECTIVE DATE**—The Architect shall implement the steps required under paragraph (1) not later than 30 days after the date of the enactment of this Act.

(c) **METERS**—Not later than 90 days after the date of the enactment of this Act, the Architect of the Capitol shall evaluate the accuracy of the meters in use at the Capitol Power Plant and correct them as necessary.

(d) **REPORT ON IMPLEMENTATION**—Not later than 180 days after the date of the enactment of this Act, the Architect of the Capitol shall complete the implementation of the requirements of this section and submit a report describing the actions taken and the energy efficiencies achieved to the Committee on Transportation and Infrastructure of the House of Representatives, the Committee on Commerce, Science, and Transportation of the Senate, the Committee on House Administration of the House of Representatives, and the Committee on Rules and Administration of the Senate.

Revolving Recycling Fund

US Code 1824a – Recyclable Materials, stipulates the AOC to collect and sell recyclable materials. In 2005, the AOC established a program for the collection and sale of recyclable materials from the Capitol buildings and grounds. Proceeds from the sale of recyclable materials are placed into an established revolving fund.

Per US Code 1824a, the revolving fund is available provided that the AOC send prior notice to the Committees on Appropriations of the House of Representatives and Senate. The funds may be used for the following purposes:

- (a) to carry out the recycling program;
- (b) to carry out authorized programs and activities of the Architect to improve the environment;
- (c) to carry out authorized programs and activities of the Architect to promote energy savings.

Funds from Senate recycling activities are currently used to pay for the operations of the Senate gym, as authorized in previous legislation (section 4 of the Legislative Branch Appropriations Act, 2001 (2 U.S.C. 121f)).

Utility Reimbursements for Steam and Chilled Water (P.L. 113-76, Div. I, Title I, and prior year Appropriations Acts)

The Capitol Power Plant may collect amounts for the lighting, heating, power (including the purchase of electrical energy) and water and sewer services for the Capitol, Senate and House office buildings, Library of Congress buildings, and the grounds about the same, Botanic Garden, Senate garage, and air conditioning refrigeration not supplied from plants in any of such buildings; heating the Government Printing Office and Washington City Post Office, and heating and chilled water for air conditioning for the Supreme Court Building, the Union Station complex, the Thurgood Marshall Federal Judiciary Building and the Folger Shakespeare Library, expenses for which shall be advanced or reimbursed upon request of the Architect of the Capitol and amounts so received shall be deposited into the Treasury to the credit of the appropriation for the Capitol Power Plant.

Vehicle Charging Stations

AOC Reimbursements Collected and Posted to a Specific AOC Appropriation Battery Recharging Stations (2 U.S.C. §2170, P.L. 112-167 (Senate); and 2 U.S.C. §2171, P.L. 112-170 (House)). In 2012, AOC was authorized to establish battery recharging stations for privately owned vehicles in parking areas under the jurisdiction of the U.S. Senate and the U.S. House of Representatives at no net cost to the Federal Government. Any fees, charges, or commissions collected by AOC shall be deposited to the credit of the appropriations account for the Capitol Power Plant. Monies deposited are available for obligation in the fiscal year collected or the fiscal year following the year collected.

FY 2015 Data Tables

The following performance charts were created to provide a summary of the AOC's progress in meeting the requirements under the Energy Policy Act of 2005 (EPA2005) and the Energy Independence and Security Act of 2007 (EISA2007).

FY 2015 Energy Management Performance Report

GOAL PERFORMANCE				
Energy Management Requirement	FY 2003 Btu/GSF	FY 2015 Btu/GSF	Percent Change FY 2003 - 2015	FY 2015 Goal Target
Reduction in Energy Intensity in Facilities Subject to the EPAct Goals	172,678	118,424	-30.9%	-30.0%
Renewable Energy Requirement	Renewable Electricity Use (MWH)	Total Electricity Use (MWH)	Percentage	FY 2012 Goal Target
Eligible Renewable Electricity Use as a Percentage of Total Electricity Use	70,245	308,782	22.7%	7.5%
Water Intensity Reduction Goal	FY 2007 Gallon/GSF	FY 2015 Gallon/ GSF	Percent Change FY 2003 - 2015	FY 2015 Goal Target (AOC Internal Metric)
Reduction in Potable Water Consumption Intensity	28.2	23.5	-16.7%	-16%
Metering of Electricity Use	Cumulative # of Buildings Metered	Cumulative % of Electricity Metered	Cumulative % of Appropriate Buildings Metered	FY 2015 Goal Target
Standard Electricity Meters in FY 2015	42	15%	65%	Met
Advanced Electricity Meters in FY 2015	23	85%	35%	Met
Total Electricity Meters in FY 2015	65	100%	100.0%	100.0% (Met)
Federal Building Energy Efficiency Standards			Percent of New Building Designs	FY 2007 Forward Goal Target
Percent of New Building Designs Started Since Beginning of FY 2007 That are 30 Percent More Energy Efficient Than Relevant Code, Where Life-Cycle Cost Effective:			100%	100%
INVESTMENTS IN ENERGY AND WATER MANAGEMENT				
Sources of Investment	Investment Value (Thou. \$)		Anticipated Annual Savings (Million Btu)	
Direct Obligations for Facility Energy Efficiency Improvements	\$1,742.00		27,000.0	
Investment Value of ESPC Task/Delivery Orders Awarded in Fiscal Year	\$0.0		0.0	
Investment Value of Utility Energy Service Contract Task/Delivery Orders Awarded in Fiscal Year	\$0.0		0.0	
Total	\$1,742.00		27,000.0	
			Percentage	
Total Investment as a Percentage of Total Facility Energy Costs			3.4%	
Financed (ESPC/Utility Energy Service Contract) Investment as a Percentage of Total Facility Energy Costs			0.0%	

FY 2015 Energy Management Data Report

Part 1: Energy Consumption Data

EPAct GOAL SUBJECT BUILDINGS							
Energy Type	Consumption Units	Annual Consumption	Annual Cost (Thou. \$)	Unit Cost (\$)	Unit of Measure	Site-Delivered Btu (Billion)	Est. Source Btu (Billion)
Electricity	MWH	197,394	\$21,659.60	\$ 0.10	/kWh	674	2,128
Fuel Oil	Thou. Gal.	162	\$399.80	\$2.86	/Gallon	23	23
Natural Gas	Thou. Cubic Ft.	1,127,336	\$14,758.00	\$11.92	/Thou Cu Ft.	1,127	1,179
Coal	S. Ton	1,452	\$577.80	\$ 315.04	/S. Ton	41	41
Purch. Steam	BBtu	14	\$689.60	\$36.94	/MMBtu	14	31
Purch. Chilled Water	BBtu	6.6	\$ 730.30	\$57.24	/ MMBtu	6.6	8.4
Excluded Steam (-)	BBtu	(173.1)	\$ (6,007.30)	\$ 33.61	/ MMBtu	(173)	(234)
Excl. Chilled Water (-)	BBtu	(41.7)	\$(639.60)	\$ 16.67	/ MMBtu	(42)	(53)
Excluded Security (-)	BBtu	(50.0)	\$(694.20)	\$ 0.10	/kWh	(50.0)	(158.0)
Purch. Renew Electric.	MWH	70,245	\$7,562.20	\$0.11	/kWh	240	0.0
Purch. Renew. Other	BBtu	0.0	\$ -	\$ -	/ MMBtu	0.0	0.0
		Total Costs:	\$37,875.10		Total:	1,859	2,966
FY 2015 Goal Subject Buildings Gross Square Feet (Thousands)		15,700			Btu/GSF:	118,423	188,883
Goal Subject Buildings FY 2003 Baseline (Btu/GSF)		172,693					

EPAct GOAL EXCLUDED BUILDINGS							
Energy Type	Consumption Units	Annual Consumption	Annual Cost (Thou. \$)	Unit Cost (\$)	Unit of Measure	Site-Delivered Btu (Billion)	Est. Source Btu (Billion)
Electricity	MWH	41,143	\$4,208.50	\$ 0.10	/kWh	140	444
Fuel Oil	Thou. Gal.	435.0	\$ 1,230.30	\$ 2.86	/gallon	61	61
Natural Gas	Thou. Cubic Ft.	27,134	\$ 356.60	\$ 11.92	/Thou Cu Ft.	27	28
Coal	S. Ton	0.0	\$ -	\$ -	/S. Ton	0.0	0.0
Purch. Steam	BBtu	0.0	\$ -	\$ -	/MMBtu	0.0	0.0
Purch. Chilled Water	BBtu	0.0	\$ -	\$ -	/ MMBtu	0.0	0.0
Excluded Steam (-)	BBtu	173	\$5,817.9	\$ 33.61	/ MMBtu	173	234
Excl. Chilled Water (-)	BBtu	41	\$ 695.0	\$ 16.67	/ MMBtu	42	53
Excluded Security (-)	BBtu	50	\$694.20	\$ 0.10	/kWh	50	158
Purch. Renew Electric.	MWH	0.0	\$ -	\$ -	/kWh	0.0	0.0
Purch. Renew. Other	BBtu	0.0	\$ -	\$ -	/ MMBtu	0.0	0.0
		Total Costs:	\$ 13,336.70		Total:	493.2	977.9
FY 2015 Goal Excluded Buildings Gross Square Feet (Thousands)		1,083.3			Btu/GSF:	455,272	902,710
Goal Excluded Subject Buildings FY 2003 Baseline (Btu/GSF)		121,847					

ALL RENEWABLE ENERGY USE (INCLUDING NON-ELECTRIC) AS A PERCENTAGE OF FACILITY ELECTRICITY USE		
All Renewable Energy Use (Billion Btu)	Total Facility Electricity Use (Billion Btu)	RE as a Percentage of Energy Use
70,245	308,782	22.7%

Part 2: Water Consumption Data

WATER USE INTENSITY AND COST				
Potable Water	Annual Consumption (Million Gallons)	Annual Cost (Thou. \$)	Facility Gross Square Feet (Thou.)	Gallons per Gross Square Foot
Buildings & Facilities Water Usage	394	\$6,036.50	16,784	23.5
				Percent
Approx. Percentage of Reported Water Consumption that is Estimated:				70%

Part 3: Energy Efficiency Improvements

DIRECT AGENCY OBLIGATIONS				
	FY 2015		Projected FY 2016	
	(Million Btu)	(Thou. \$)	(Million Btu)	(Thou. \$)
Direct Obligations for Facility Energy Efficiency Improvements, Including Facility Surveys/Audits		\$1,742.00		\$2,300.00
Estimated Annual Savings Anticipated from Obligations	27,000.0	\$540.00	25,000.0	\$500.00

ENERGY SAVINGS PERFORMANCE CONTRACTS (ESPC)		
	Annual Savings (Million Btu)	Task Orders/Savings (Number/Million \$)
Number of ESPC Task/Delivery Orders Awarded in Fiscal Year & Annual Energy (MMBTU) Savings	0	0
Investment Value of ESPC Task/Delivery Orders Awarded in Fiscal Year		\$0.0
Amount Privately Financed Under ESPC Task/Delivery Orders Awarded in Fiscal Year		\$0.0
Cumulative Guaranteed Cost Savings of ESPCs Awarded in Fiscal Year Relative to the Baseline Spending		\$0.0
Total Contract Award Value of ESPCs Awarded in Fiscal Year (Sum of Contractor Payments for Debt Repayment, M&V, and Other Negotiated Performance Period Services)		\$0.0
Total Payments Made to All ESPC Contractors in Fiscal Year		\$8.8

